
Chapter 10

General Project Procedures

General Project Procedures

1. Introduction	240
2. Definition of project engineering.....	240
2.1 General	240
2.2 Functional Aspects	243
2.3 Institutional Aspects.....	246
3. Project procedure	247
3.1 General	247
3.2 Stage 1: Feasibility Studies	248
3.3 Stage 2: Basic and Preparatory Engineering	250
3.4 Stage 3: Procurement.....	253
3.5 Stage 4: Final Engineering	254
3.6 Stage 5: Supervision and Control of Project Execution.....	255
3.7 Stage 6: Plant Organization, Personnel.....	259
3.8 Stage 7: Start-up and Commissioning	260
3.9 Stage 8: Audit.....	260
4. Differentiation between minor and large projects.....	261

1. INTRODUCTION

Nowadays, the implementation of extensive projects, either within the company or in collaboration with others, tends to an increasing complexity and interdependence between various parameters.

In this connection great demands are made upon managing bodies and far-reaching responsibilities are delegated.

This chapter shall give a short overview about project engineering in general in order to serve as a guideline for project implementation.

2. DEFINITION OF PROJECT ENGINEERING

2.1 General

Project engineering has to be understood as a collective name for all planning, supervising, coordinating and controlling measures to be taken in order to find a feasible solution for a project, whereby the procedure to work out the solution, the required staff and means, their engagement and co-ordination is more important than the solution itself.

In order to achieve an efficient project engineering procedure it is important to distinguish between **functional** and **institutional aspects**:

The main features of the **functional aspects** are the planning and control task which are necessary to set and keep a project in motion, containing in particular the following topics:

- ◆ Project planning
- ◆ Project control
- ◆ Project information system

The **institutional aspects** concern formation of working teams, control and decision making bodies as well as their tasks, competences and interdependences. These topics are established within the

- ◆ Project organization.

The attached graph (Fig. 2/1) shows the interconnections between project engineering and a typical proceeding pattern.

It is obvious that the problem solving cycles which are composed of

- ◆ Situation analysis
- ◆ Objective fixation
- ◆ Synthesis (patternwise assembling of individual solutions)
- ◆ Analysis (of the generated solution concepts)
- ◆ Evaluation
- ◆ Decision

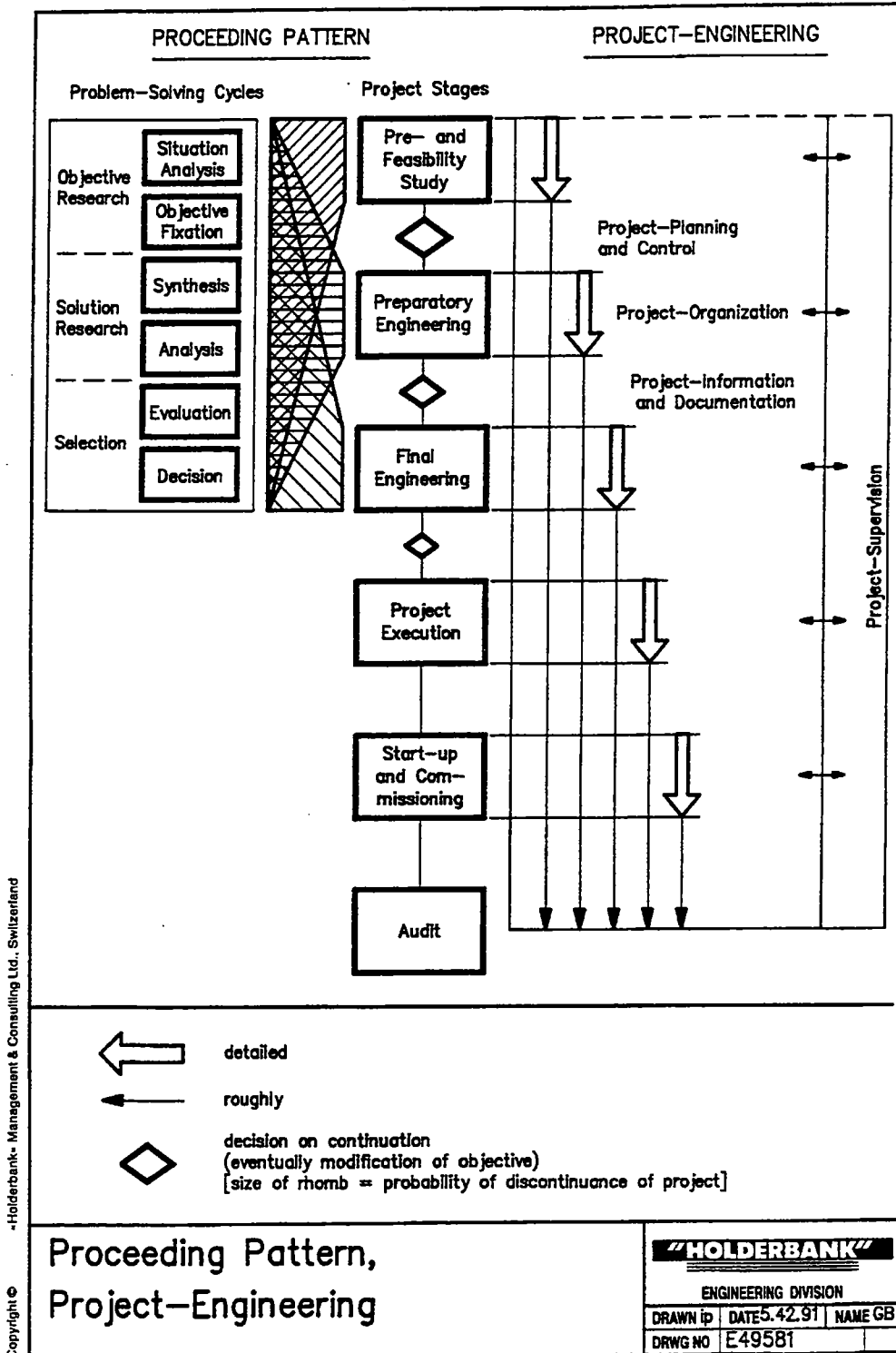
come up for each stage of the project proceeding pattern.

Furthermore, it shows the progress from the rough to the detailed degree of elaboration following stage by stage and the decreasing probability of discontinuance.

Coming along with the progress of the project the degree of knowledge about the system/project increases, whereas the degree of acceptable unawareness about the system/project decreases.

(See Fig. 2/2)

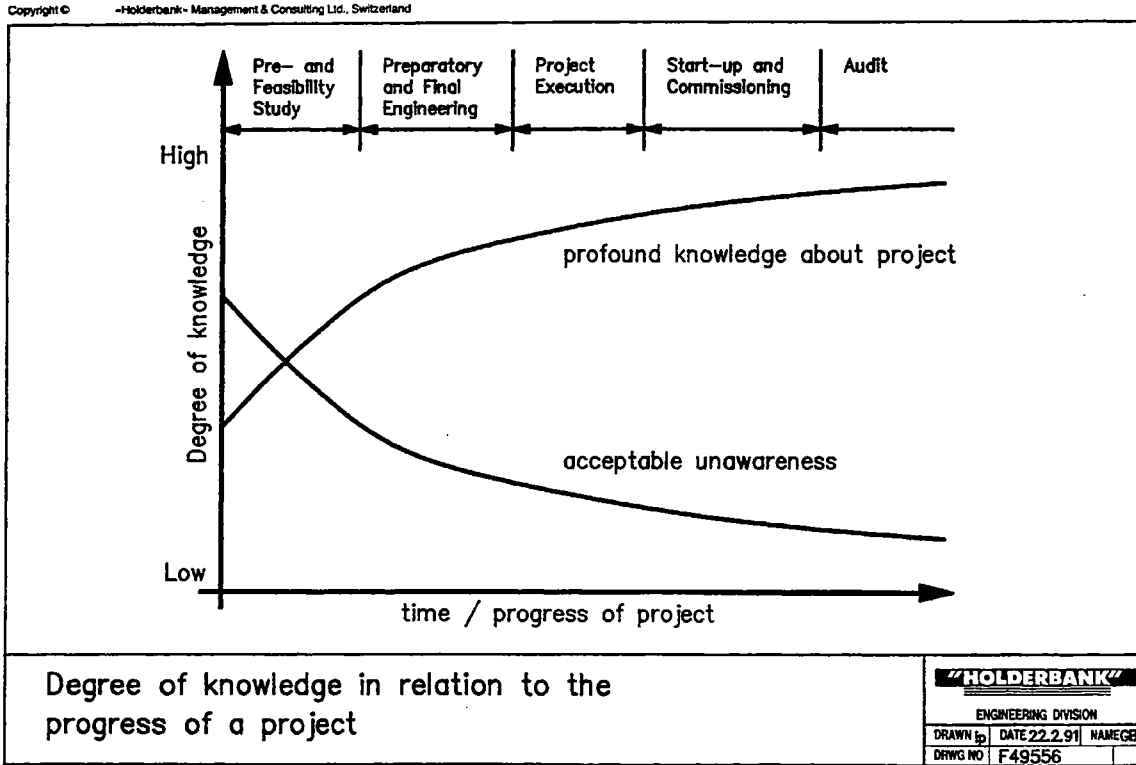
Figure 2/1 Proceeding Pattern, Project-Engineering



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Figure 2/2 Degree of knowledge in relation to the progress of a project



2.2 Functional Aspects

2.2.1 Project Planning

The project planning comprises mainly a determination of intermediate objectives, planning of an implementation organization, cost estimation, time schedule and of a project information and documentation system.

The existence of plans enables an efficient communication among the people involved in the project and a significant alignment of their engagement for achieving the project goals.

The above-mentioned aspects of planning can be represented in a succession, whereby the observance of the file listed below is recommended as suitable for most cases.

- a) Planning intermediate objectives
A clear definition what the results shall be of each project stage.
- b) Definition of individual tasks
The better the definitions of individual tasks, the easier to co-ordinate the realization of a project (concepts, engineering).
- c) Termination strategy
The investigation of the interdependencies between individual tasks shall lead to a clearly structured termination strategy, evident for all people involved.
- d) Requirements estimation
Estimation of the required personnel, time and means in regard to quality and quantity for each defined individual task.
- e) Organization planning
See project organization para 2.2.4.
- f) Cost estimation
Based on the requirements estimation (d) the cost for the project realization shall be estimated (including additional expenses for training of personnel, consulting etc.). In order to avoid unrealistic estimations it is advisable to talk to the designated responsible person.
- g) Target - dates (milestones)
So as to have a proper progress control and thus a more efficient project control it is recommended to set target-dates (milestones).
- h) Budget
A budget comprises all costs which are required for the implementation of a task and have been approved by an authorized body.
- i) Project information system
See para 2.2.3.

2.2.2 Project Control

Project control means that necessary measures are taken to specify and correct actions in order to carry through the decisions taken during the project planning phase.

The following measures could be a part of project control:

- ◆ Assignment of tasks, competences and responsibilities as far as this hasn't been done during the project organization phase.
- ◆ Introduction, motivation and protection of collaborators.
- ◆ Supervision of the problem solving progress (surveying and interpretation of relevant values).
- ◆ Taking measures if plan deviations occur (including correction of plans and goals).
- ◆ Co-ordination of
 - different project stages
 - client and project team
 - different working teams within the project team

2.2.3 Project Information System

If people shall be able to act in a co-ordinated pattern they must have sufficient information at their disposal.

Therefore, a well-organized information system is required in order to provide the right information to the right person at the right time.

One can distinguish in two main types of information:

- ◆ **orientation information** within the project team such as decision minutes (concerning goals, concepts, strategies), problem-related information with direct impact on the task of concerned people, instructing information etc.
- ◆ **control information** which characterize deviations from the planned implementation procedure.

In this connection it is an important task of the project engineering to coordinate the activities of the various working teams.

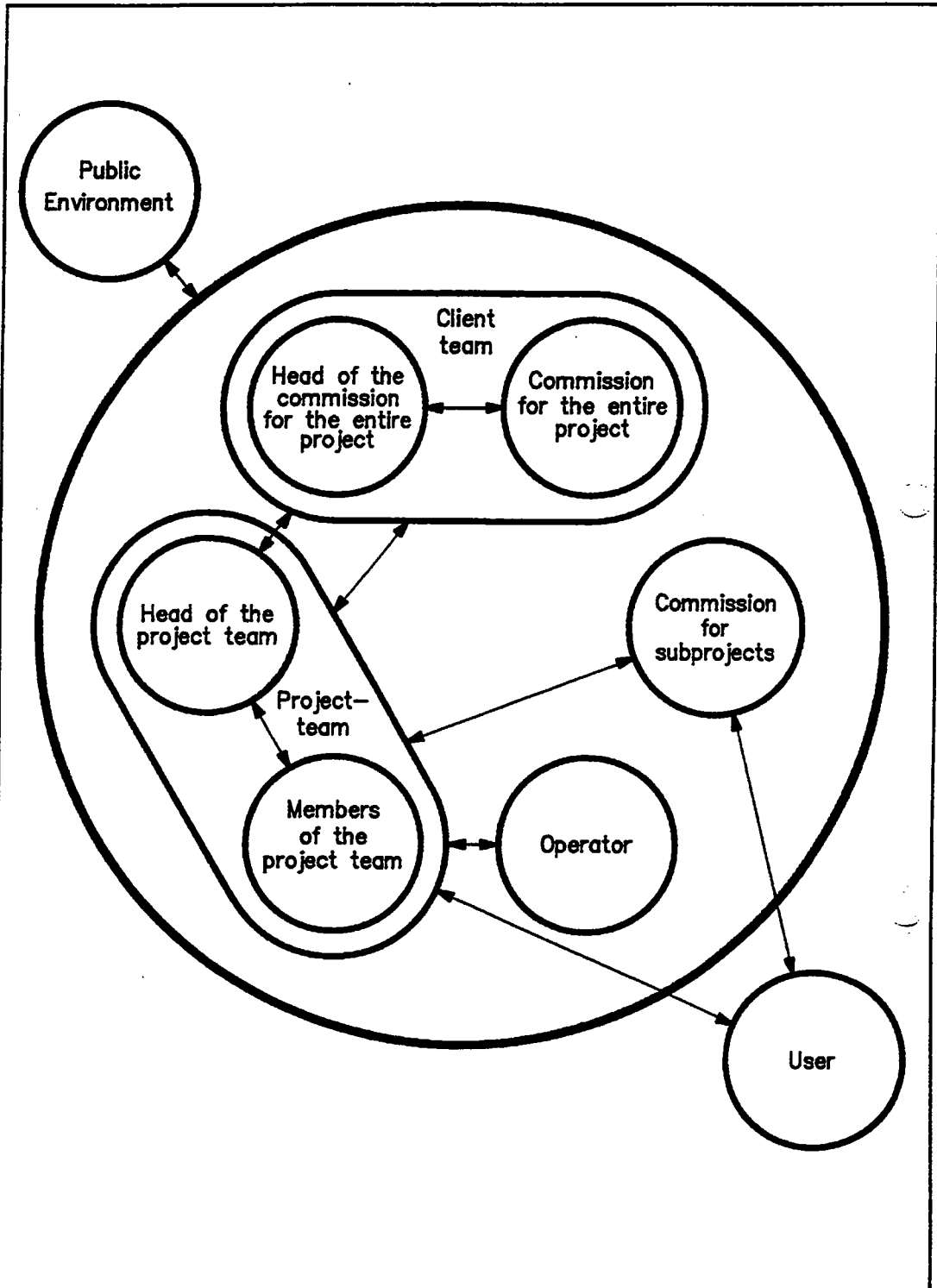
The required reports during the project progress have the purpose of putting on record the elaborated knowledge and to provide it for subsequent project stages and projects.

All members of the project team and people concerned must be given insight into these reports in order to avoid overlapping task and engagement as well as loss of time.

A general idea to the creation of such an information system is attached (Fig. 2/3).

The main positions which give or receive information are itemized. The connection lines represent the ways of information exchange which can be realized either visual or in writing (depending on the importance and/or the extent of the information).

Figure 2/3 Project Information System (typical)



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Project Information System
 (typical)

"HOLDERBANK"		
ENGINEERING DIVISION		
DRAWN ip	DATE 22.2.91	NAME GB
DRWG NO	F49557	

2.3 Institutional Aspects

2.3.1 Project Organization

The organization of a project specifies the sort and arrangement of working teams, control and decision making bodies as well as their tasks, competences and interdependences.

The institutional aspect of project engineering is characterized by comparing problem-guided working teams (partly or completely releasing of collaborators out of their original position within the company's organization depending on the importance and priority of a project) and their organizational institution. The task of such an institution is a systematic implementation of a project in accordance with their delegated competences, the provided means and relevant conditions. The composition of these working teams (institution) can change from project stage to project stage according to the respective requirements. After the project implementation is carried out, the problem-guided project organization is splitted up and its members return to their original positions within the company's organization.

The head of the project team is responsible for the technical, temporal and financial aspects and has to suggest suitable measures to be discussed and carried out in order to gain the set targets.

3. PROJECT PROCEDURE

3.1 General

This part refers to the procedure of project execution (Fig. 3/1) for any major capital investment projects starting with the prefeasibility studies and leading through to the audit.

PRE-INVESTMENT PHASE

Identification of Potential Projects

Corporate Planning	}	Closely linked planning activities which enables the company to identify future needs, financial investment and other
Plant Masterplan	}	aspects for maintaining optimal plant operation.

Initiating of Specific Projects

Stage 1: Feasibility Studies
Stage 2: Basic and Preparatory Engineering
Stage 3: Procurement

INVESTMENT PHASE

Execution of Project

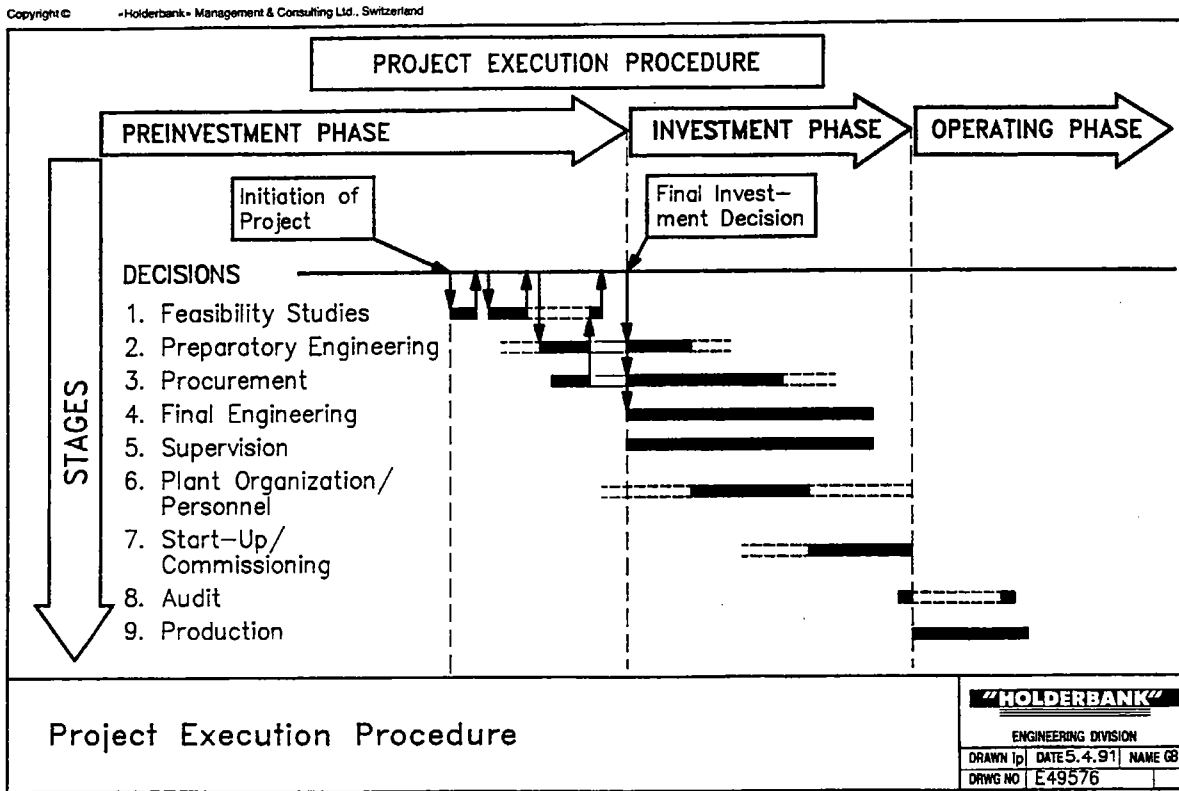
Stage 4: Final Engineering
Stage 5: Supervision and Control of Project Execution
Stage 6: Plant Organization, Personnel
Stage 7: Start-Up and Commissioning

OPERATIONAL PHASE

Operation of the Equipment

Stage 8: Audit

Figure 3/1 Project Execution Procedure



3.2 Stage 1: Feasibility Studies

The first step to be taken in order to make an investment decision for a well defined project is to establish a technical, economic, legal and often also political base.

Once a more detailed evaluation of a specific investment opportunity (potential project) is justified, the company will have to establish a temporary organizational structure and budget for this purpose. In case where the tasks exceed the capacity and expertise of the company, external consultants and experts should be called in to render assistance.

This project organization, preferably located outside the operating units of the company, has to perform all activities within well defined cost-time- and quality limits to facilitate the necessary major decision by the company which might eventually lead to the final investment decision.

The elaboration of a techno-economic feasibility study is rather costly and time consuming. Therefore, before assigning funds for such a study, a preliminary assessment of the potential project is often made in a prefeasibility study which shall show whether or not it is justified to proceed with the detailed feasibility study. The prefeasibility study is a short version of the feasibility study.

A feasibility study shall elaborate on and evaluate alternative solutions which can be applied under the prevailing conditions of the projects.

The activities of such a feasibility study concentrate on the following main topics:

Cement market :	review and evaluation of characteristics and trends
Environment :	impact on project of socio-economic environment
Raw materials :	reserves, raw maxis, recultivation strategy
Plant location :	considering local conditions, availability of labour and infrastructure, land acquisition, fiscal and legal regulation
Process and technical plant concept :	process, mechanical/electrical equipment, utilities, civil works, operation and maintenance
Infrastructure and housing facilities :	transport, power, water, housing facilities
Organization and staff requirements :	organizational structure, manpower
Investment cost :	fixed investment and pre-operation capital expenditures
Production expenses :	fixed and variable production expenses, personnel expenses
Implementation time schedule :	activity schedule, target dates, interfaces, completion
Financial projections and project profitability :	investigation of the economic feasibility of the project, determination of funds required to finance the project, determination of project profitability

The duration of a feasibility study depends mainly on the time required for raw material investigations.

3.3 Stage 2: Basic and Preparatory Engineering

According to Fig. 3/2 and 3/3 the stage of basic and preparatory engineering is located within the liquid phase of the project progress, i.e. the remaining solutions, preselected and based on the feasibility study should be investigated carefully in order to reduce the number of alternatives and finally to determine the project ideas in such detail as required to produce drawings, schemes, flow sheets and specifications.

The purpose of the basic and preparatory engineering is to complete the engineering work as far as required for calling for tenders based on comprehensive and detailed tender documents (including specifications) for all supplies and services, broken down in accordance with the contracting plan. In particular the specifications have to be prepared as detailed as possible in order to obtain comparable offers.

Furthermore, lots of vagueness which demands for further inquiries can be avoided by clearly defined tender documents and specifications.

In a well-managed project no subsequent changes and revisions should occur, since these are time-consuming and can cost a lot of money, especially after the procurement.

In respect of contract negotiations, the work-packages should be identified and responsibilities assigned for their execution including liability, guarantees and insurance.

Contract proposals can be prepared and a preselection of suppliers and contractors can already be made.

Concerning cost estimate(s) it has to be mentioned that establishment of detailed and final investment cost estimates which, after approval, may be used as the binding investment budget for project execution should be carried out at this stage of the project.

Accuracy of cost estimate(s) generally still range between 95% and 100%.

Project organization and administrative structures must now be established, methods and procedures for cost-, time- and quality control selected, the activities of all parties involved coordinated, corrective measures initiated if deviations from set targets occur and regular project progress reports prepared.

All typical organization pattern during the planning period is given on figure 3/4.

Obtaining outstanding permissions from national and local authorities as well as outlining of project financing requirements and scheme are further tasks to be carried out.

Figure 3/2 Degree of freedom versus project realization progress

DEGREE OF FREEDOM VERSUS PROJECT REALIZATION PROGRESS

DEGREE OF FREEDOM
RANGE OF POSSIBILITIES

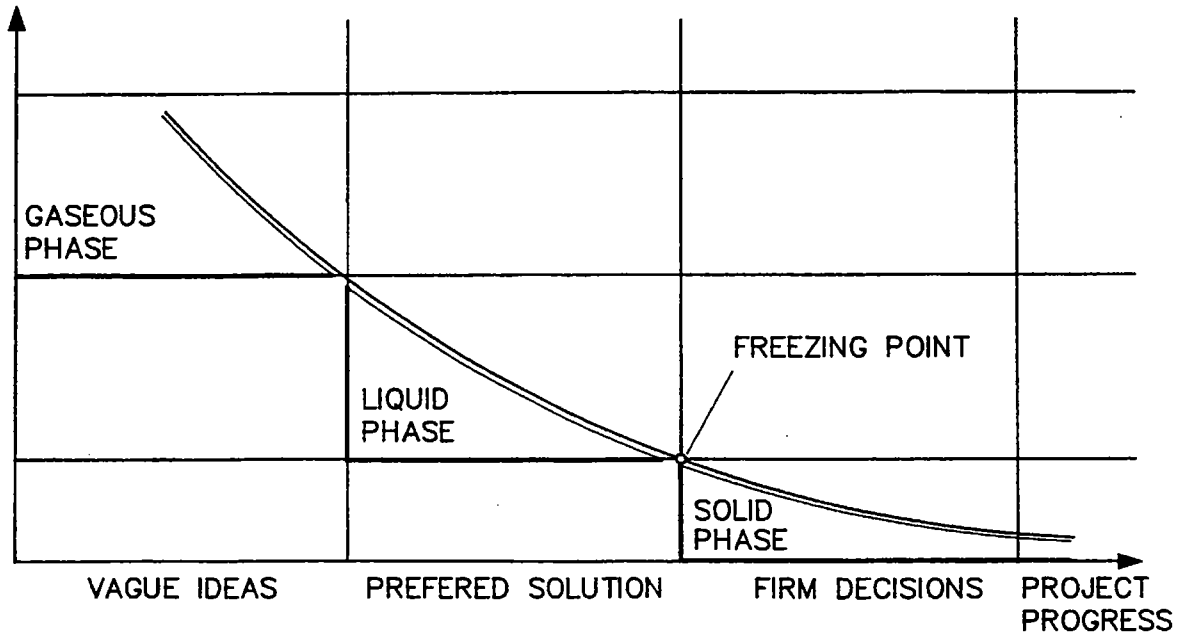


Figure 3/3 Constitutions phases and activities of project planning and execution

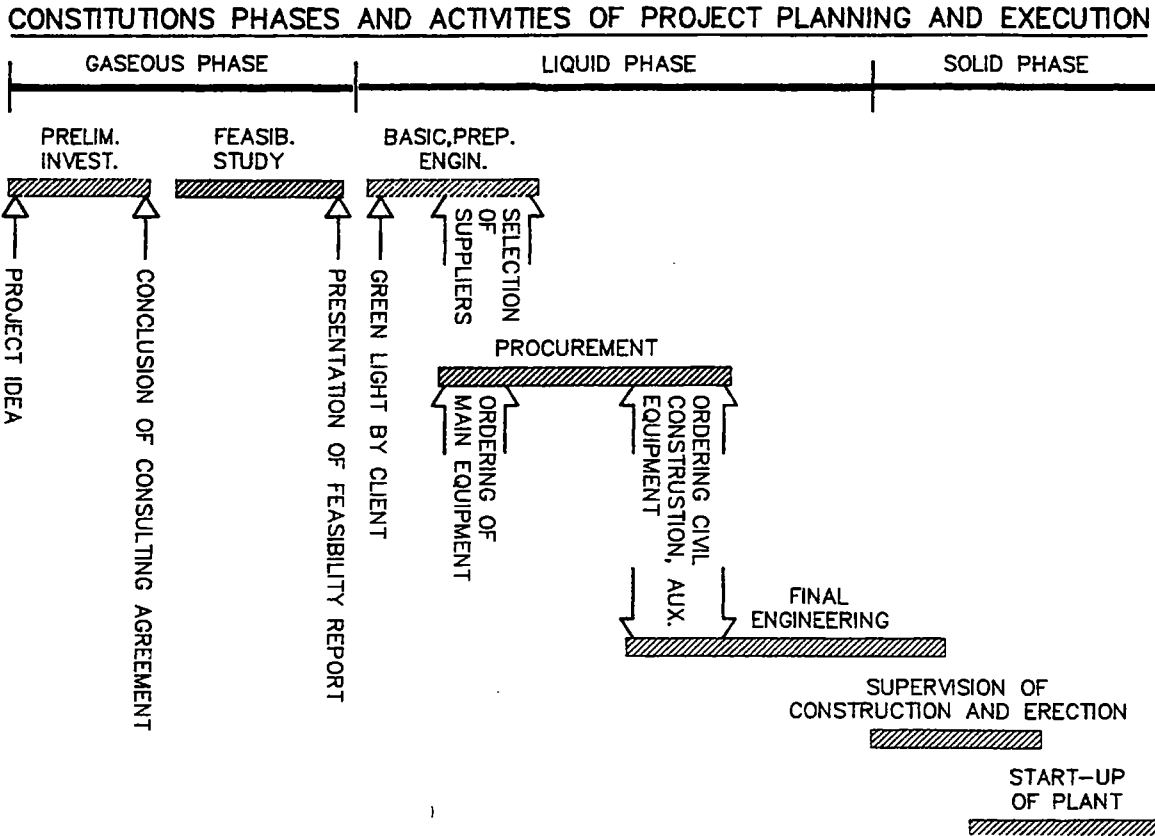
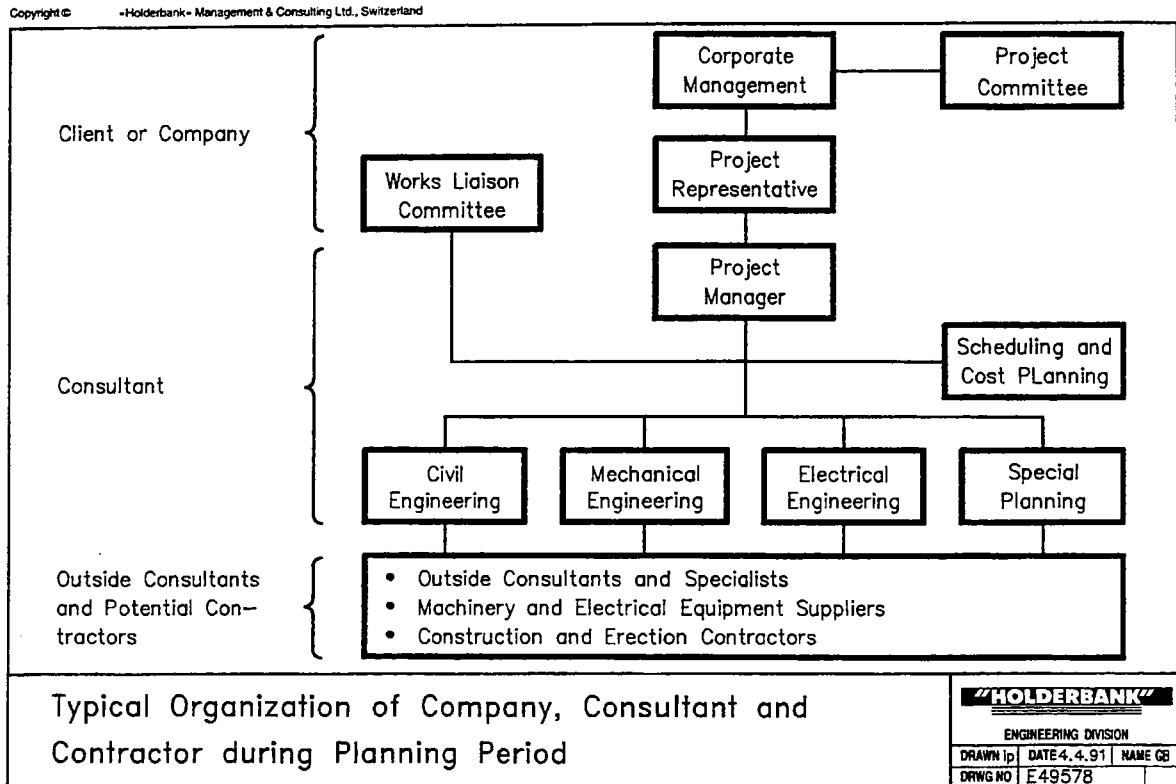


Figure 3/4 Typical organization of company, consultant and contractor during planning period



3.4 Stage 3: Procurement

The purpose of the procurement is the achievement of readiness for placing orders.

First the purchasing procedure has to be initiated by issuing of the Tender Documents.

After receiving of the tenders the evaluation of the offers and accordingly the preparation of purchase recommendation has to be made.

Contract negotiations will follow and not to forget import licenses for equipment and permit for payments in foreign currency has to be obtained if necessary.

Adjustment of final investment cost estimate, will take place if necessary, after binding tender prices are available for part or total of supplies and services. Accordingly a rerun of the investment return and funding projection based on above final investment cost estimate and actual financing conditions have to be performed.

3.5 Stage 4: Final Engineering

During the final engineering all detailed engineering work should be completed in order to allow for timely manufacture and erection of equipment and installations including modifications and/or new civil works (if required).

Company involvement varies significantly with the established contracting plan, i.e. minor whenever a general contractor is applied (like turnkey) but substantial where the company does its own detail design and lets small contract packages.

The final engineering comprises tasks as follows:

- ◆ Securing approval of investment budget
- ◆ Securing authority to place orders
- ◆ Preparation of specifications and drawings (including final equipment arrangements) for the manufacturers equipment
- ◆ Preparation of detail drawings for construction/modification of civil work (if necessary), erection and installation
- ◆ Preparation of all documents and data schedules to coordinate above activities (including project manual)

3.6 Stage 5: Supervision and Control of Project Execution

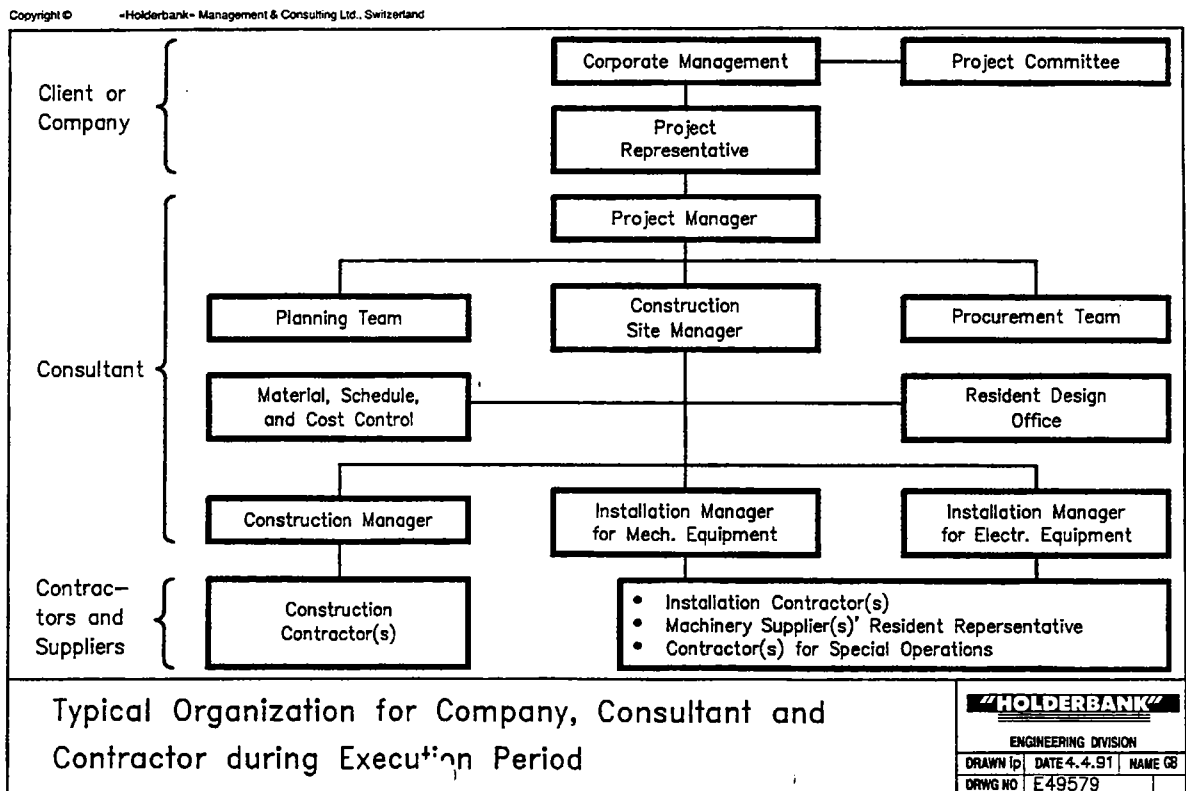
An overall project monitoring and control system for quick identification of problems and deviations from set targets to enable fast and adequate corrective actions must be implemented. Hence, a pertinent organization structure is required, comprising client, consulting and contractor (see Fig. 3/5)

3.6.1 Approval

All contractors final documents, data, specifications and drawings have to be reviewed and approved that they reflect the detailed technical concept as specified and indicated in the contractual documents. Further works must not be released prior to approval!

Checking and approving of drawings and calculations is an important and time-consuming task and it should for that reason go without saying that sufficient time must be allowed for it in any network program. As it is not rare that drawings or calculations must be refused, time should be allowed for a repetition of design work and another checking without jeopardizing the milestones of the project time schedule. In order to economize on time for this approval procedure, it is of utmost importance that all parties involved are really co-operating efficiently.

Figure 3/5 Typical organization for company, consultant and contractor during execution period



3.6.2 Budget and Progress Control

For various reasons the budget is one of the most important set-points for the project manager.

What budget control system ever is applied (there are various software programs on the market), it must inform the project manager about the following data:

- ◆ Original budget
- ◆ Commitments of the company in connection with this project up to date
- ◆ Work executed/deliveries received
- ◆ Payments up to date
- ◆ Expected/most probable final cost
- ◆ Revised budget, if applicable

It is essential to control not only the suppliers (should be clearly defined by the contracts) but also additional internal costs which can arise, e.g. by supplementary installation of ventilation or air-conditioning equipment, working hours of employees etc.

The delays between commitment, delivery and payment are a matter of company policy, respectively contract conditions which can normally not be influenced by the project management.

In order to keep in track with the most probable budget figure and the expected completion date it is indispensable to apply a commensurate control system, nowadays usually carried out by one out of various software programs which are on the market (e.g. Timeline, CAPM) (Fig. 3/6 and 3/7).

Figure 3/6 Project progress

Project Progress

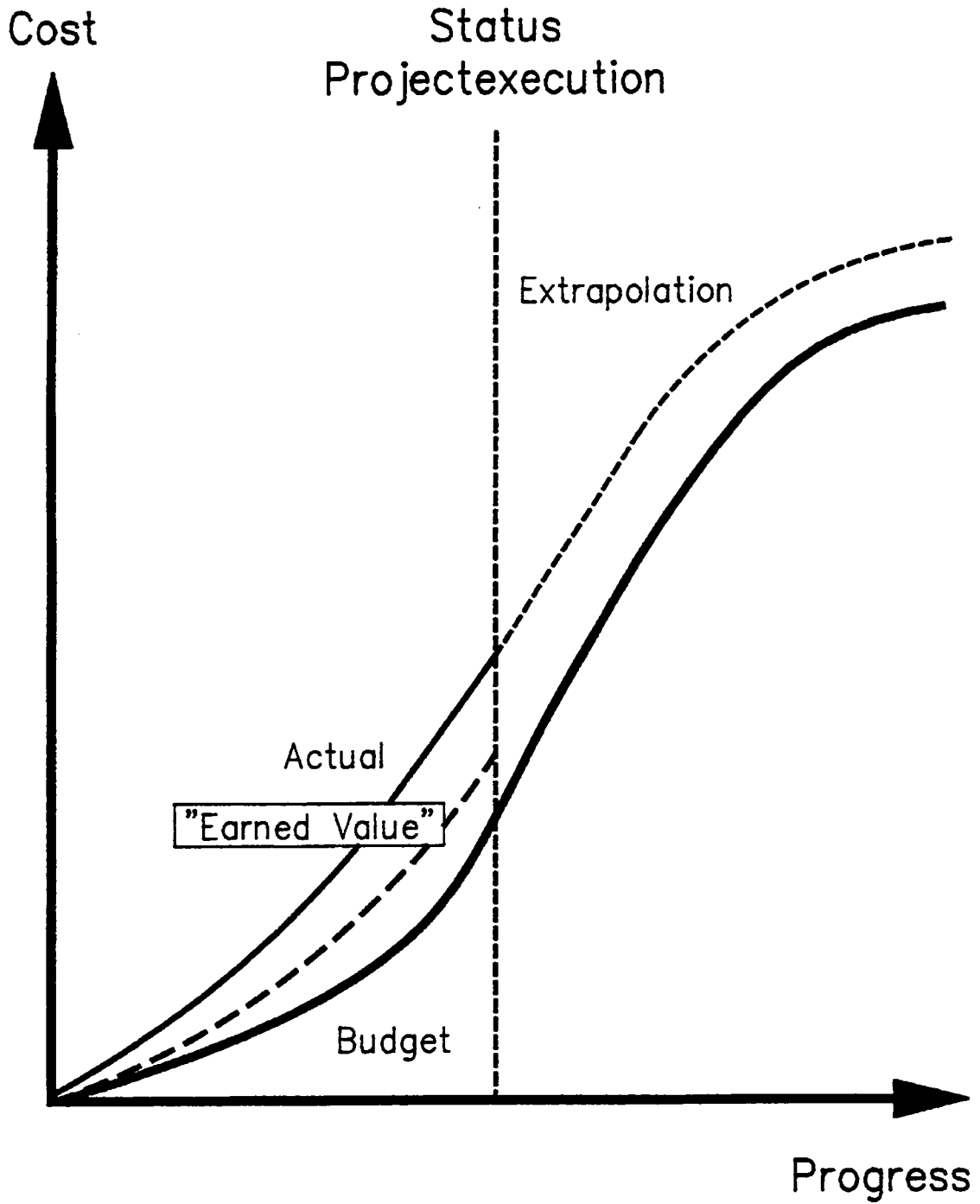
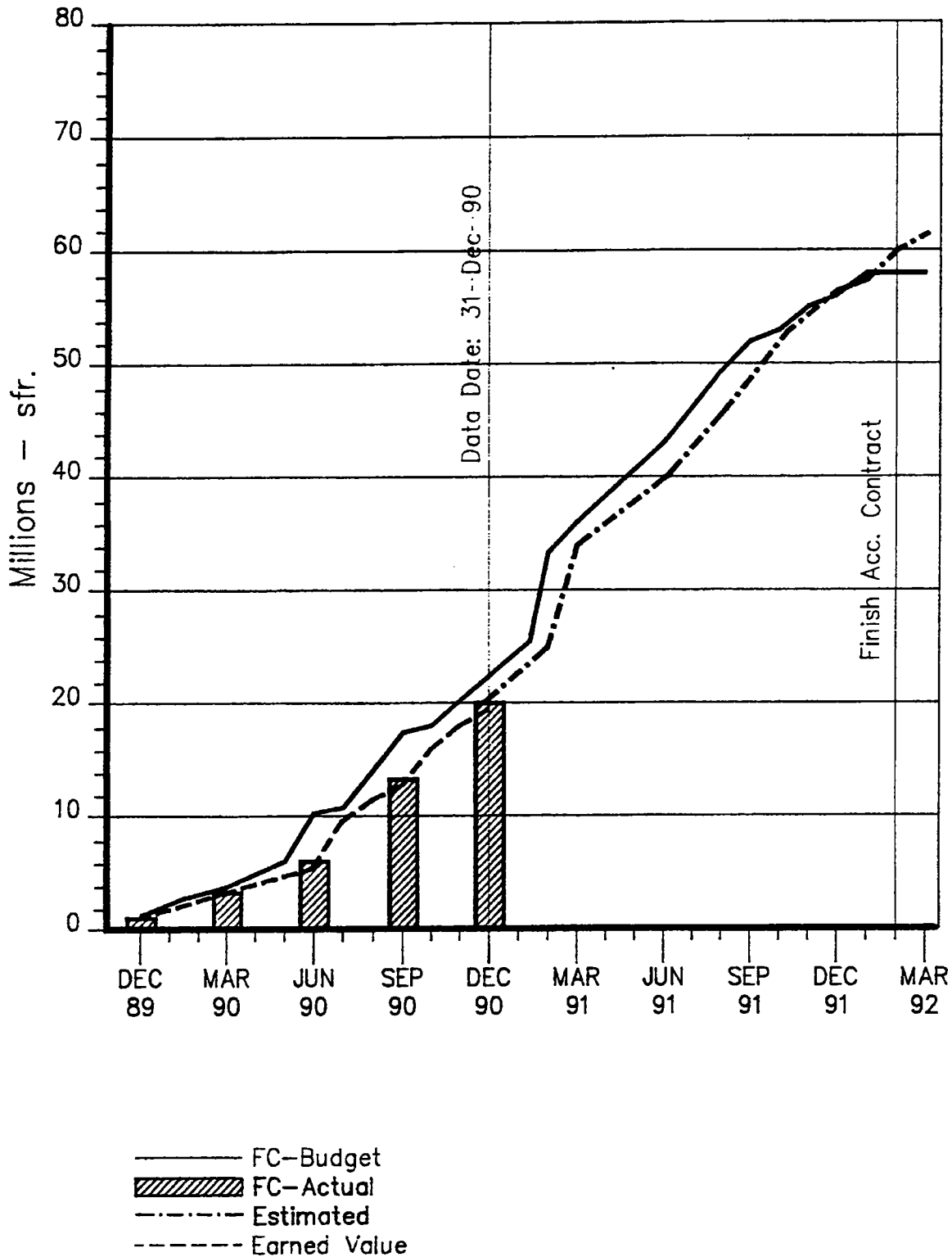


Figure 3/7 Cost report - Status: 31-Dec-90

Costreport – Status: 31-Dec-90

(Budget – Actual – Estimated – Earned Value)



3.6.3 Quality Control

Quality (and quantity) control means in the very widest sense to assure a good value of the works and suppliers.

Quality control comprises activities like the following:

- ◆ Checking and approving of drawings, delivery specifications, installation plans, diagrams, etc.
- ◆ Inspections at manufacturer's shops in order to witness material tests, test-runs, etc.
- ◆ Checking of execution of all works (civil), mechanical erection, electrical installation, etc.) according to approved plans, approved specifications and the applicable standards
- ◆ Checking of all quantities used for civil construction work (quantity surveyor)
- ◆ Checking of progress of work at site, etc.

In order to really be able to perform this controlling function, it is necessary that any contract allows the project management to withhold payments if the quality of material or workmanship is not according to the satisfaction of the project management.

In this context, the delivery schedule and the payment schedule need mentioning, because they must be balanced in such a way that the project manager really has the possibility to manipulate the supplier/contractor by not releasing payments.

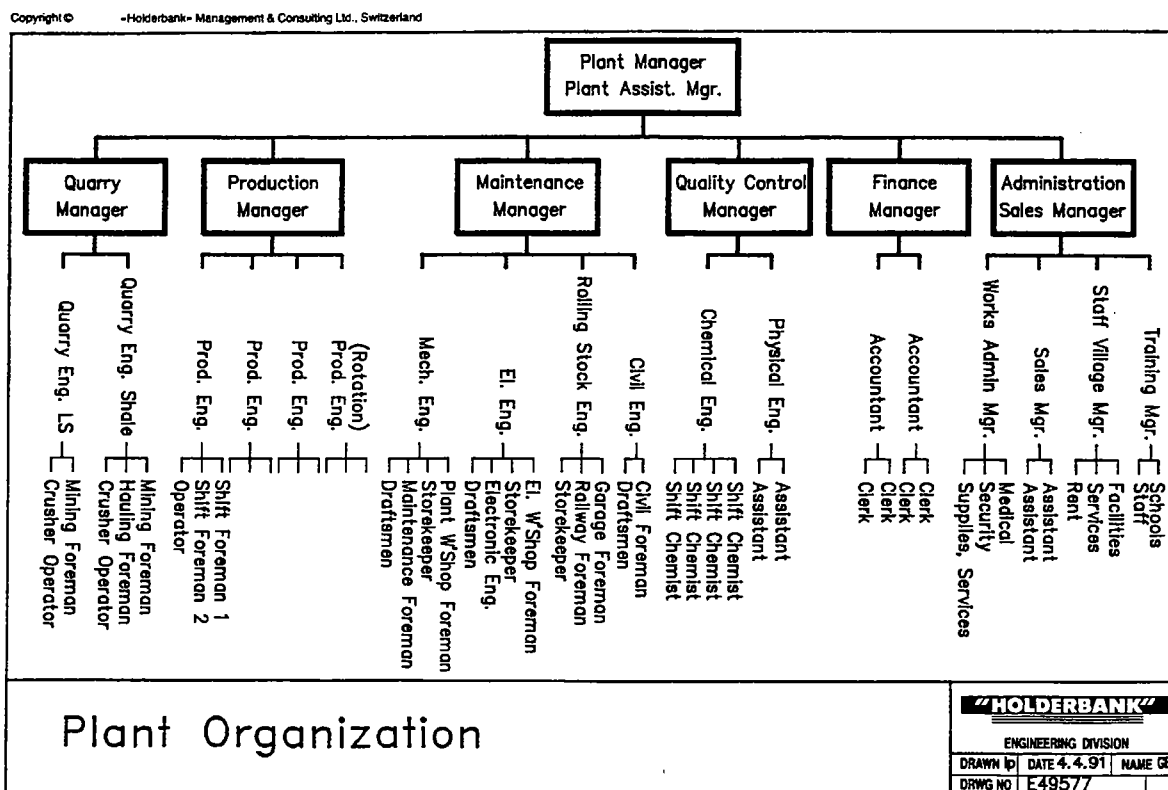
3.7 Stage 6: Plant Organization, Personnel

It is of importance to establish an adequate organization and personnel infrastructure (Fig. 3/8) already at an early date to operate and maintain the plant as well as assurance of raw materials and utilities for start-up and normal operation.

The main tasks are as follows:

- ◆ Design and implementation of organizational structures for plant operation to be ready at start-up
- ◆ Preparation of plant manual
- ◆ Ensuring availability of raw materials correctives, additives and consumables, spare parts
- ◆ Selection and training (if required) of personnel and introduction to project before start-up
- ◆ Providing operating and maintenance manuals and instructions

Figure 3/8 Plant organization



3.8 Stage 7: Start-up and Commissioning

Once the construction/modification of buildings and the erection and installation of equipment is approaching its completion, commissioning of equipment commences.

Before commissioning can start the whole equipment and installation has to be checked against completion and function, i.e. idle, part- and full-load test runs have to be carried out as well as repairs and adjustments if required.

Furthermore, a performance test has to be executed (conduct and supervision) and deficiency lists to be compiled as a part of taking-over certificates.

However, it has to be ensured that contractual obligations by suppliers are met with the objective to achieve a continuous routine operation at full rated output immediately after provisional taking-over of the respective plant section(s).

Issuance of pertinent certificates where appropriate and determination of penalties for unfulfilled performance guarantees shall take place.

A due documentation has to be adjusted or composed and issued.

3.9 Stage 8: Audit

The purpose of the audit is the evaluation of results achieved and recording the experience gained in order to refine cost estimates and project procedures for the future.

To audit project procedures and organization (best carried out before the project team breaks up) are tasks of an audit as well as to audit the technical concept and economic projections as soon as the relevant plant section(s) and equipment is in satisfactory continuous operation and the financial magnitude have stabilized.

4. DIFFERENTIATION BETWEEN MINOR AND LARGE PROJECTS

Since the expenditure of a project can vary significantly a differentiation concerning project size has to be considered in order to dispose the commensurate project implementation procedure.

The most likely differentiation is to differentiate between projects which require a production interruption and projects where it is not needed to stop producing clinker, respectively cement.

Minor Projects	Large Projects
Main Features	
<p>Do not require a production stoppage</p> <p>Tasks concerning the infrastructure of a cement plant such as water supply system, lighting, heating, cooling etc.</p> <p>Can mostly be carried out by the company's personnel.</p>	<p>Require a production stoppage</p> <p>Tasks concerning certain sections of a production line such as the installation of a separator to an existing mill (incl.) electrical work and commissioning) or the erection of a waste heat recovery system etc.</p> <p>Co-operation with external suppliers (one or more)</p>
People Involved	
<p>The hierarchical plant organization does not change, it is only completed by the existence of a project coordinator (chosen out of the existing plant organization) in order to control the technical, temporal and financial project implementation but without authorities over the plant staff.</p> <p>First priority of the people involved is their daily works, whereas the respective energy optimization project is of second priority (with a preferred completion date, but can be postponed)</p>	<p>A project team can be composed with people out of the existing plant organization (and eventually completed by consultants, suppliers etc.) in regard to subordinate their daily work and to be able to concentrate on the respective energy optimization project as a full-time job of first priority.</p> <p>A project team can be composed out of consultants, suppliers, i.e. an external project team.</p>
Minor Projects	Large Projects
Procedure	
<p>Engineering</p> <p>Procurement of material (out of workshop, spare parts storage, local markets or oversee)</p> <p>Installation and commissioning</p> <p>Audit</p>	<p>Preparatory engineering</p> <p>Procurement of material (mainly from foreign suppliers)</p> <p>Final engineering</p> <p>Supervision and control of project execution</p> <p>Start-up and commissioning</p> <p>Audit</p>

Remarks	
<p>It is important to mention the danger of getting bogged down or falling into oblivion in particular for this type of project since they are less urgent and don't have a determined completion date.</p> <p>Such projects are often carried out by the maintenance team.</p>	<p>Since this type of project requires a production interruption it is of utmost importance to have it well planned and coordinated in order to achieve the shortest possible stoppage.</p> <p>Such projects are often carried out by the maintenance team during a production stoppage for maintenance work.</p> <p>It would for that reason be advantageous to have member(s) of the maintenance department as part of the project team since they are used to carrying out such planning (incl. co-ordination of provision of auxiliary equipment such as ladders, cable reels, emergency lighting, lifting platforms, welding equipment etc.) in respect of avoiding misplanning and achieving a shortest possible production stoppage.</p>

PROJECT MANAGEMENT

**Brief Guide and Checklist for Capital Expenditure Projects
for
Replacement and Modifications of existing Plant Facilities**



**“Holderbank” Management and Consulting Ltd.
Engineering Switzerland**

**March 1996
HES/ZKZS/LEU**

PROJECT MANAGEMENT

Key Issues

1. GENERAL

1.1 Definition of Project

- Technical idea / concept to be studied and or realized.

Main features:

- Project has to fulfill certain **requirements**, assure certain **performances**.
- Project has **defined start and end**, time required depends on internal and external constraints
- Project has a **limited** budget
- Project requires **special organization**, it is often disturbing factor in permanent organization

1.2 Initiation of Project

- Initiated project should be outflow from masterplan
- Initiation shall be done in written form:
 - setting of objectives
 - establish main tasks and responsibilities
 - name project manager and project team
 - outline stepwise procedure

2. STUDIES

- Set-up organization and procedures
- Review of requirements compared with present situation (same / higher / lower), all parties concerned to be involved
- Study of alternative solutions, at later stage time will not be available (literature, suppliers, HMC)

- > Assessment of alternatives based on:
 - > technical criteria
 - > experience / references
 - > economical aspects
- > Decision to proceed with project
 - > introduction in investment list or presentation of investment proposal (possibly in Basic Engineering Phase)

3. BASIC ENGINEERING

- > Adapt organization and procedures to project phase
- > Establish contracting plan
 - > taking into account complexity of project, own resources etc.
 - > choice between:
 - detail engineering (several contracts)
 - packages (2 to 3 contracts)
 - turn-key (1 contract)

Detail engineering is being preferred solution for "Holderbank".

- > Establish time schedule with key events
- > Preparation of Tender Document

Note: - Tender Document shall only be issued once high probability of project realization is being established.

Purpose: - Definition of technical criteria, scope of supply and commercial conditions

- Safeguard interest of Client
- Provide basis to Tenderers to prepare Tender
- Provide basis to Client to evaluate Tenders

Form: - Tender Document preferably issued in future Contract Form

- > Preselection of Tenderers
 - > at least 3 to 4 Tenderers
- > Evaluation of Tenders

Comparison tables to be prepared containing:

- > technical data

- scope of supply
- warranties
- experience / references
- commercial conditions

The evaluation criteria are laid down in the Tender Document.

Tables can be prepared during Tendering Period, do not await Evaluation Period.

- Preparation of investment request => Approval by Management to proceed with realization of project

4. DETAILED ENGINEERING / PROJECT EXECUTION

- Adjust project organization and procedures to requirements
- Contract negotiations
 - at least 2 potential Contractors to create competitive situation
 - technical aspects and warranties to be clarified first
 - price negotiations to be assured by small team and not carried out under time pressure, apply target price policy.
 - all contractual matters to be solved during negotiations and incorporated into Contract, in execution phase power of Client is being reduced.
- Establish tight cost and time control
- Check and approval of Contractor's drawings, to be done with necessary care, concerned parties to be engaged (production, maintenance)
- Workshop inspection
 - engagement of outside experts to be considered (global purchasing of Contractors)
- Site supervision
 - adequate site supervision to be assured, also required to coordinate site activities with plant operations
 - establish and update list of deficiencies
- Start-up and Commissioning
 - involvement of personnel from operations and maintenance
 - arrange foreseen performance tests
- Project audit
 - to be carried out about 12 months after commissioning by project team and operations / maintenance

- review of following:
 - project execution
 - performance, recalculate savings, IRR and pay-back period and compare with investment request
 - outline of conclusions for present and future projects

Annex 1: Investment Cost Estimate
Annex 2: Investment Proposal / Request
Annex 3: Tender Document / Table of Content

INVESTMENT COST ESTIMATE		
Project :		
Phase :		
Description	Cost Mio	Cost Mio
1. <u>Disassembly and Demolishing</u>		
Disassembly M&E-Equipment	
Removal steel structure	
Demolishing civil structures	
Disposal equipment, steel and civil structures	
Total 1 : Disassembly and Demolishing	-
2. <u>Mechanical Equipment</u>		
Machine No. 1 :	
Machine No. 2 :	
Machine No. 3 :	
Machine No. 4 :	
Machine No. 5 :	
Total Mechanical Equipment (Basis FCA)	
Transport and Insurance	
Taxes and Duties	
Erection	
Commissioning	
Total 2 : Mechanical Equipment	
3. <u>Electrical Equipment</u>		
Medium Voltage Distribution & Transformers	
Low Voltage Distribution and Motor Control Centers	
Plant Automation	
Instrumentation	
Drives and Motors	
Cabling, Grounding, Lightning Protection	

Description	Cost Mio	Cost Mio
Total Electrical Equipment (Basis FCA)	
Transport and Insurance	
Taxes and Duties	
Erection	
Commissioning	
Total 3 : Electrical Equipment	-
4. <u>Structural Steel and Civil Works</u>		
Structure 1 :	
- Excavation	
- Concrete Works	
- Structural Steel Works	
- Various (blockworks, windows, etc.)	
Structure 2	
- Excavation	
- Concrete Works	
- Structural Steel Works	
- Various (blockworks, windows, etc.)	
Structure 3 :	
Excavation	
- Concrete Works	
- Structural Steel Works	
- Various (blockworks, windows, etc.)	
Total 4 : Structural Steel and Civil Works	-
5. <u>Engineering</u>		
Mechanical Engineering	
Electrical Engineering	
Civil Engineering	
Total 5 : Engineering	-

Description	Cost Mio	Cost Mio
6. <u>Various</u> Contingencies	
Total 6 : Various	-
GRAND TOTAL 1-6	-

Above cost estimate does not include VAT and cost for spare parts.

Date: Name and Signature:

Investment Cost Estimate

Typical Cost Structure in %

1.	Mechanical Equipment	100 %
1.1	Transport and Insurance	5 % of 1.
1.2	Erection and Commissioning	30 % of 1.
2.	Electrical Equipment	30 % of 1.
2.1	Transport and Insurance	5 % of 2.
2.2	Erection and Commissioning	30 - 50 % of 2.

Accuracy of Investment Cost Estimate

Phase:	Studies	+ 20 %
	Basic Engineering	+ 10 %
	Detailed Engineering	+ 5 %

INVESTMENT PROPOSAL / REQUEST

Project :

1. PRESENT SITUATION

- Description of problems
- Loss of production
- Extra cost involved (production, maintenance)

2. ALTERNATIVES INVESTIGATED

- Description of alternatives
- Advantages / Disadvantages
- Selection of alternative(s)

3. SOLUTION PROPOSED

- Detailed description
- Proposed suppliers
- References

4. INVESTMENT COST ESTIMATE

- Basis of cost estimate
- Cost estimate (budget)

5. ECONOMICAL EVALUATION

- Cost difference (savings) between present situation and proposed solution
- IRR-Calculation
- Pay-back-calculation (usually not more than 2 to 3 years)

6. TIME SCHEDULE

- Duration of project execution
- Critical path

Annexes : Investment cost estimate

Date:

Name and Signature:

Approved:

Date:

Name and Signature:

Comments:

TENDER DOCUMENT**TABLE OF CONTENT**

PART A : Tendering Conditions

- **General Information**
 - Purpose
 - Client
 - Brief description of project
 - Scope of tender
 - Proposed time schedule
- **Conditions of Tendering**
 - Commercial part
 - Lumpsum price in ... currency
 - Price breakdown and weights
 - Time schedule
 - Comments on supply contract proposal
 - Technical part
 - Technical specifications
 - Technical specification sheets
 - Schematas and drawings
 - Reference list
 - Warranties
 - Alternative proposals
 - Date of submission of tenders

PART B : Contract Proposal

- ❑ **Supply Contract Proposal**
- ❑ **Annex 1 : General Information**
 - Information on existing equipment related to project
 - Process data to be observed for proposed project
 - Material data (raw materials, additives, correctives, cement compositions, etc.)
- ❑ **Annex 2 : General Requirements on Mechanical Equipment**
 - Standards to be applied
 - Standardization (gears, clutches, etc.)
 - Requirements and design criteria on individual equipment (e.g. filters, conveyors)
 - Painting and colour codes
- ❑ **Annex 3 : General Requirements on Electrical Equipment**
 - Standards to be applied
 - Voltage levels
 - Standardization (instruments, safety devices etc.)
 - Sub-control systems
 - Drives
- ❑ **Annex 4 : Technical Specifications**
 - Supplier's specifications (from successful Tenderer)
 - Technical specification sheets
- ❑ **Annex 5 : Services**
 - Mechanical Engineering
 - Electrical Engineering
 - Civil Engineering
- ❑ **Annex 6 : Time Schedule**
 - Detailed time schedule

- **Annex 7 : Price Breakdown**
 - Individual prices and weights (from successful Tenderer)
- **Annex 8 : Performance Warranties and Tests**
 - Procedures for measurements of warranties and conducting of performance tests
- **Annex 9 : Workshop Inspections**
 - Tests to be conducted by contractor at individual manufacturing steps
 - Tests to be carried out by Client / Engineer at individual manufacturing steps
- **Annex 10 : Drawings**
 - Flowsheet
 - Arrangement drawings

SUPPLY CONTRACT

Key Conditions

1. PRICE

- Fixed lumpsum price, preferably in local currency

2. PAYMENT CONDITIONS

- 20 (30) % as down payment, against advance payment bond for amounts above USD 50'000.--
- 50 (60) % at delivery
- 10 (20) % at provisional acceptance against warranty bond

3. TIME SCHEDULE

- Overall time schedule
- Special schedule (shut down period, etc.)

4. WARRANTY PERIOD

- 12 (24) months starting from provisional acceptance

5. WARRANTIES

- Delivery time
- Overall time for project execution (from coming into force up to provisional acceptance)
- Shut-down time
- Performance (capacities, clean gas content of filters)
- Function and quantity
- Lifetime of special parts (e.g. gear boxes up to 5 years)
- Lifetime of wear parts (e.g. filter bags up to 2 years)

6. PENALTIES

- Penalties due in case of non fulfillment of above warranties except for clean gas content, which has to be achieved.
 - Penalties in % of lumpsum price for delays and non fulfillment of performances
 - Replacement (partial) of equipment not reaching lifetime

7. INSURANCE

- Transport insurance by Contractor
- Third party liability insurance by Contractor
- Erection Insurance / All Risk Insurance by Contractor or Client

8. BONDS

- Bonds to be issued by a first class bank, occasionally Concern Guarantees are being accepted.

9. MODIFICATION OF CONTRACT

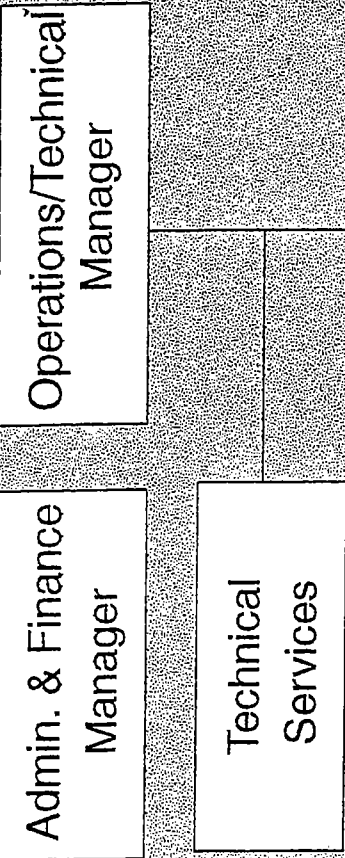
- Modification to be agreed in writing,

10. COMING INTO FORCE

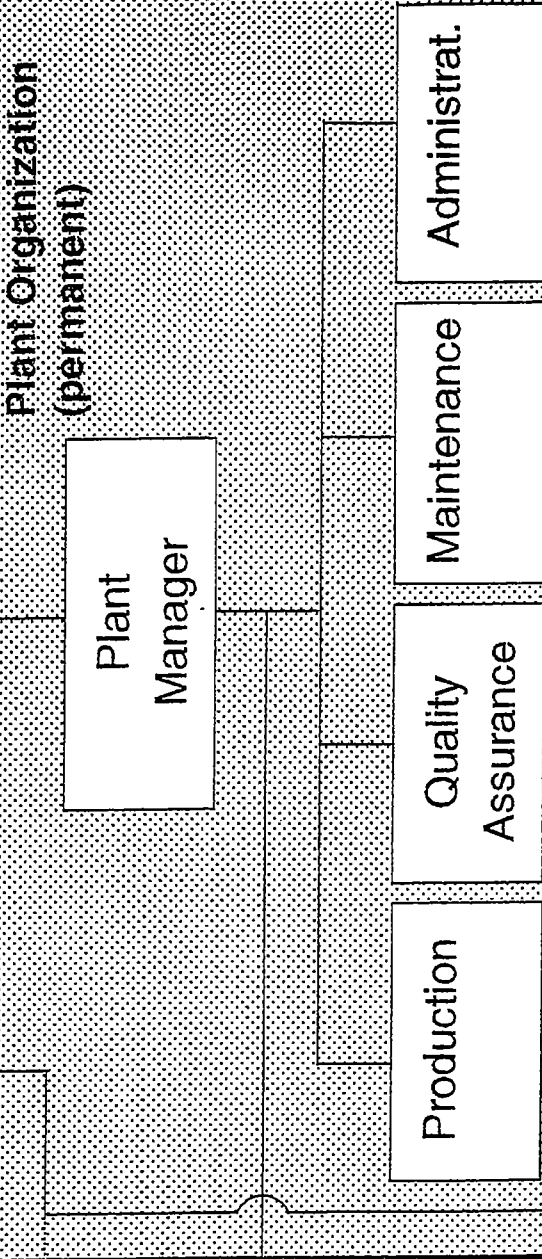
- Conditions to be clearly defined.

Typical Project Organization for "small" CAPEX Projects

Company Organization (permanent)



Project Organization (temporary)



Corporate Engineering

Project Manager

Other Consultants

Civil Engineer

M-Eng
E-Eng

- Project Team Members
- ★ Consultation